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DOE ORDER # 4700.1

94-RF 07174

DIST.	LTR	ENC
AMARAL, M. E.		
BERMAN, H. S.		
BRANCH, D. B.		
CARNIVAL, G. J.		
COPP, R. D.		
DAVIS, J. G.		
FERRERA, D. W.		
HANNI, B. J.		
HARMAN, L. K.		
HEALY, T. J.		
HEDAHL, T.		
HILBIG, J. G.		
HUTCHINS, N. M.		
KELL, R. E.		
KIRBY, W. A.		
KUESTER, A. W.		
MAHAFFEY, J. W.		
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MARX, G. E.		
McDONALD, M. M.		
McKENNA, F. G.		
MONTROSE, J. K.		
MORGAN, R. V.		
POTTER, G. L.		
PIZZUTO, V. M.		
RISING, T. L.		
SANDLIN, N. B.		
SATTLOCK, G. H.		
STEWART, D. L.		
STIGER, S. G.	✓	
SULLIVAN, M. T.		
SWANSON, E. R.		
WILKINSON, R. B.		
WILLIAMS, S. (ORC)		
WILSON, J. M.		
WYANT, R. B.		
A. Bicher	✓	
C. Mast	✓	
Uklingame	✓	
CORRES CONTROL	X	X
ADMN RECORD	✓	
PATS/T130G		
TRAFFIC		

CLASSIFICATION

UCNI		
UNCLASSIFIED	✓	
CONFIDENTIAL		
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AUTHORIZED CLASSIFIER SIGNATURE
DOCUMENT CLASSIFICATION
REVIEW WAIVERED PER
CLASSIFICATION OFFICE

IN REPLY TO RFP CC NO.: N/A

ACTION ITEM STATUS
☐ PARTIAL/OPEN
☐ CLOSED

LTR APPROVALS:

TYPIST INITIALS
AB / cb

EG&G ROCKY FLATS

EG&G ROCKY FLATS, INC.
ROCKY FLATS PLANT, P.O. BOX 464, GOLDEN, COLORADO 80402-0464 • (303) 966-7000

July 7, 1994 94-RF-07174

Jessie M. Roberson
Acting Assistant Manager for
Environmental Restoration
DOE, RFFO

Attn: Jen Pepe

OPERABLE UNIT NO. 5, ROCKY FLATS PLANT WOMAN CREEK PRIORITY DRAINAGE - SGS-394-94

Action: Review response comments and forward to the Environmental Protection Agency (EPA) and Colorado Department of Health (CDH)

Attached are the responses to the review comments received from Environmental Protection Agency (EPA) and Colorado Department of Health (CDH) regarding the Draft Final Technical Memorandum No. 13, Addendum to Final Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) Work Plan, Human Health Risk Assessment Model Description for Operable Unit No. 5, Rocky Flats Plant Woman Creek Priority Drainage, dated November 29, 1993.

SG Stiger

S. G. Stiger
Director
Environmental Restoration Program Division

CAB:cb

Orig. and 1 cc - J. M. Roberson

Attachment:
As Stated

cc:
M. H. McBride - DOE, RFFO
R. J. Schassburger - DOE, RFFO
M. N. Silverman - DOE, RFFO
L. W. Smith - DOE, RFFO

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	Figure 2-4	Figure 2-4 seems to exclude domestic use of ground water, is this agreed upon? There is no minimum defined by the State Engineers Office or by WQCD that precludes domestic use of any ground water that can be brought to the surface. Therefore, we think domestic use of ground water should be part of the risk assessment if a residential scenario is used.	The CSM was initially presented in the OU5 EATM, TM12, and comments were received from the agencies. Responses to these additional comments on the CSM cannot be drafted until the responses pending on TM12 are resolved.
33	Section 3.2.1	BCF3 may not work as well as advertised, especially for a steady state model with a single layer. It may be a good idea to have an alternate model for variably saturated conditions.	At this time, we believe BCF2 will work for a steady state model. If difficulties arise, a second layer can be added and/or a transient model with small time steps, for a very long time period, can be used as an alternate. If extreme difficulties arise, we have experience using SWIFT III for water table conditions.
34	Section 3.2.1	The error variance referenced to Cooley 1977 cannot be minimized before discretization of the model, it is simply a measure of goodness of fit calculated from observed minus computed heads. To determine an acceptable calibration criteria determine the rise of a cell across the gradient. It may be useful to diagram the gradient and overlay variously sized cells to determine the acceptable error. Anderson and Woessner suggest finer nodal spacing and/or multiple layers to deal with the gradient problem (page 59).	As stated in TM13, the calibration targets and criteria for the solute transport model will not be established until all of the data generated during implementation of the RFI/RI work plan have been reviewed and evaluated. Using a finer grid is an approach to minimizing problems which may be encountered due to the topographical relief at OU5, and this method will be implemented.

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34	Section 3.2.1	The reference as given was incorrect. The reference to the standard error was in Cooley, 1977 in Water Resources Research 13 (2), 318-324. Vol 15 contained a second part of this paper published in 1979.	The reference to Cooley (1977) in the text will be corrected to (13)2.
	Page 33 and 39	Pages 33 and 39 state that there is not enough data to validate the calibrated model, for OU5 this is probably true. Because these models will probably be used for other decisions beyond the HHRA it may be timely to suggest that a postaudit be conducted on the predictions as further monitoring data is collected.	The purpose of this model is to support the HHRA. A postaudit would be appropriate to the Feasibility Study model.

Reviewer's Name: Elizabeth Pottorff Organization: Colorado Department of Health Date: January 7, 1994

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	GENERAL COMMENTS	Technical Memorandum (TM13) presents the models to be used in the human health risk assessment of OU5 but does not discuss the application of the selected models to the site-specific conditions at OU5. The text states that the technical approach to be used in applying the selected models to the site-specific conditions at OU5 will be described in detail in the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) report. In order to comply with the model description requirements stated in the interagency agreement (IAG), the discussion of model application should include the following information: • A figure depicting the grid to be used for the groundwater model that indicates the model domain and cell size. • A description of the sources to be modeled that describes or depicts the location of all sources and how they will be spatially and temporally represented in the model. • A description of the data sets that will be used to calibrate the models. • A description of the data that will be used to provide initial estimates of all model parameters. • Detailed information on model calibration, including calibration criteria and calibration targets.	Please provide a copy of the cited authority or reference in the IAG that states the model description requirements. This request is submitted in accordance with the IAG, Attachment 2, Section I.B.4, paragraph 1. A figure depicting the grid, model domain, and cell size for the groundwater model cannot appropriately be determined until the contaminants of concern and the areas of contamination are identified. The contaminants of concern will be identified when all the field data has been evaluated. Evaluation of data collected during the Phase I RFI/RI field program is continuing. TM11 addresses contaminant identification and documentation. The sources to be modeled will be defined with spatial and temporal specificity from the IHSS configurations when field data have been evaluated, when data aggregation policies have been established, and when background concentrations have been defined. These data activities are continuing. Calibration procedures, when feasible, are described in the appropriate sections of TM13. For the groundwater flow model, water level measurements from the alluvial wells within the OU, including those installed prior to RFI/RI activities, will be used for calibration. For groundwater solute transport modeling, contaminant concentrations in groundwater sampled during the RFI/RI activities will be used. The model parameters, units, and range of values to be used in calibrating the surface water model are presented in Table 3-2. Contaminant concentrations in soil sampled during RFI/RI activities will be used to calibrate the soil gas transport models. Air dispersion modeling results

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	GENERAL COMMENTS (continued)		will be compared with ambient air quality monitoring data from the Radioactive Ambient Air Monitoring Program network and special OU5 samplers to assess the validity of the range of model output values. Calibration procedures are not possible for the indoor air model. As discussed in numerous places throughout TM13, field data collected during the Phase I RFI/RI activities will be used to derive input parameters in baseline risk assessment modeling exercises. A detailed explanation of calibration procedures is beyond the scope of this TM, and the commenter is referred to the text citations. The development of model calibration criteria and targets is an iterative process based on field data, which are currently being evaluated for OU5. The Cooley (1977) method will be used to evaluate calibration of the groundwater model (TM13, page 34). Donigian et al. (1984) give general guidelines for characterizing a calibration for the surface water model (TM13, page 52). Standardized calibration procedures for soil gas transport, air dispersion, and indoor air models have not been established.
	Section 2, Figures 2-2, 2-4, and 2-6	The relative significance of exposure pathways can be determined only after risk estimates are calculated. At this early stage of the remedial investigation, contaminants of concern have not been identified, and little information is available concerning the contaminated media, and level of contamination. The assumptions regarding the relative significance of exposure pathways should be viewed as "best guess" at this time. These sorts of assumptions should not form the basis for eliminating exposure routes from the quantitative risk assessment. If this	The CSM was initially presented in the OU5 EATM, TM12, and comments were received from the agencies. Responses to these additional comments on the CSM cannot be drafted until the responses pending on TM12 are resolved.

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	Section 2, Figures 2-2, 2-4, and 2-6 (continued)	approach is used, it could compromise the risk assessment and result in a significant underestimation of risk. An acceptable approach is to determine whether an exposure pathway is complete or incomplete. Incomplete pathways can be ignored, but risk for all complete pathways should be quantified. EPA's comments on Technical Memorandum 12, Exposure Scenarios for Operable Unit 5, address the exposure pathways which must be quantitatively evaluated in the risk assessment. TM13 needs to be consistent with TM12 and recognize the following exposure pathways as complete: a. Groundwater ingestion by future on site residents b. Inhalation of vapors inside future on site residences c. Inhalation of vapors while showering by future on site residents d. Dermal contact with groundwater by future on site residents e. Particulate inhalation by future on site residents	
	Figures 2-2 and 2-4	The conceptual site model indicates that ingestion of groundwater is considered a negligible or incomplete exposure pathway. This conclusion disregards the results from a pump test conducted in Woman Creek valley fill alluvium during the OU1 investigation. A well point in the alluvium was pumped at a rate of 1.5 gallons per minute (gpm) for 8 hours without depleting the source of groundwater (EG&G 1992). This test was conducted in December, typically when the lowest water	The CSM was initially presented in the OU5 EATM, TM12, and comments were received from the agencies. Responses to these additional comments on the CSM cannot be drafted until the responses pending on TM12 are resolved.

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	Figures 2-2 and 2-4 (continued)	levels of the year are measured. A well screened in this alluvium will exceed the daily water requirement of 240 gallons that is used in EG&G's domestic water supply analyses as a minimum requirement for a domestic use well. Therefore, ingestion of groundwater would be considered a potential exposure pathway in the Woman Creek valley fill alluvium on the basis of EG&G's own criterion for domestic well production.	
	Figure 2-3	The hydrogeologic profile shown in Figure 2-3 does not depict potential groundwater pathways through bedrock. A bedrock groundwater pathway should be depicted on Figure 2-3.	Figure 2-3 does not depict potential bedrock groundwater pathways for two reasons. First, suspected contamination exists in the Upper Hydrostatigraphic Unit (UHSU), which includes subcropping bedrock sandstones. Additionally, geologic characteristics of the OU indicate that a pathway from the UHSU into the underlying bedrock is not likely, since the OU is underlain by the claystones and silty claystones of the Arapahoe and Laramie Formations. The purpose of this model is to support the Risk Assessment, and the risk for contaminants to impact the public health appears to be greatest in the UHSU.
	Section 3.2 Groundwater Flow Model	A major difficulty that may be encountered when using the MODFLOW program to model groundwater flow at OU5 will be interpolation error. Interpolation errors arise when calibration well locations do not coincide with model nodes. These errors create problems when water levels simulated at the center of the nodes are compared with water levels observed at wells within the model cell, but some distance from the node. In areas of considerable relief, such as the hillside portion of OU5, the	It is agreed that water levels simulated at the center of the nodes will not accurately represent wells not located at the center of the nodes. This will be taken into account during calibration and grid design.

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	Section 3.2 Groundwater Flow Model (continued)	differences in elevation between the two points will lead to significant differences in their water level elevations, even if the model is a reasonable representation of the actual system. This problem is compounded when the saturated thickness of the layer to be modeled is very small relative to the overall topographic relief. The grid spacing of the model should be fine enough to minimize interpolation error in the hillsides, or the model will be difficult, if not impossible, to calibrate.	
33	Section 3.2 Groundwater Flow Model for Saturated Conditions	TM13 states that validation of the model will not be conducted due to the lack of sufficient data to form an independent data set. DOE must acknowledge in TM13 that not conducting validation is a source of error in the model results and, most importantly, the uncertainty this introduces must be considered when analyzing the results and making decisions based on those results.	In utilizing results we will consider the lack of additional confidence which would be imparted by validation of the model with a second data set. We are treating uncertainties with the procedure outlined in Sections 3.2.1 and 3.3.1.
38	Section 3.3.1	The text states that a one-dimensional analytical solute transport model will be appropriate to model contaminant transport through the vadose zone at the OU5 landfill because little data are available. However, even a one-dimensional unsaturated zone transport model will require reasonably accurate site-specific estimates of unsaturated zone hydraulic conductivity, matrix potential, and water content of soil. If site-specific field data are not available to estimate these parameters, the model should not be run. Include a summary of the site specific data for these parameters in Table 3-1.	A one-dimensional analytical solute transport model for contaminant transport through the vadose zone rests on several assumptions and simplifications which will be applied in a conservative manner. Under steady-state conditions, the flux is constant. With the assumption of a uniform moisture content, seepage velocity is also constant. The flux into the groundwater system can be obtained from the groundwater model and is equivalent to the flux through the vadose zone.

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38	Section 3.3.1 (continued)		When unsaturated conditions exist, seepage velocity may be estimated using the following: $V_{pw} = q / \theta$ where V_{pw} = Seepage velocity (m/s) q = Infiltration (m/s) θ = Moisture content (unitless) A conservative value for specific retention may be used for moisture content, or moisture content can be estimated using the following equation: $m = (n)(q/K_s)^{1/(2b+3)}$ where m = Moisture content in the vadose zone (unitless) n = Saturated moisture content in the vadose zone (unitless) q = Infiltration or recharge rate (m/s) K_s = Saturated vertical hydraulic conductivity (m/s) b = Soil specific exponential parameter (unitless) $1/(2b+3)$ = Soil specific exponential parameter factor estimated from EPA (1988, Superfund Exposure Assessment Manual) Additionally, some site-specific moisture contents will be available after additional field work is completed this summer.

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38	Section 3.3.1 (continued)		Saturated vertical hydraulic conductivity can be estimated as one order of magnitude less than horizontal hydraulic conductivity, which has been obtained from analyses of aquifer tests conducted in OU5. Hydraulic gradient is one and porosity is assumed. Data are also available for unsaturated hydraulic conductivities and moisture retention curves for unconsolidated materials from the 881 Hillside, which is near to OU5. These data are compiled in Fedors and Warner (1993).
	Section 3.4 Surface Water Model	The selected surface water model appears to be complex and data intensive, as indicated by the flow charts on Figures 3-2 and 3-3 and the number of parameters listed in Table 3-2. The possibility of a nonunique model solution is enhanced when there is little or no prior information on parameter values (Anderson and Woessner 1992). Therefore, the successful application of this model will probably require that site-specific data be gathered to derive initial estimates of the 21 parameters listed in Table 3-2 and defined allowable value ranges that are probably more restrictive than those listed in Table 3-2. The description of the technical approach (to be included in the Phase I RFI/RI) should indicate which of the parameters listed in Table 3-2 will rely on initial estimates and value ranges that were based on field data, estimates from literature, or arbitrary values.	The parameters shown in Table 3-2 are divided into four types: Precipitation/Runoff, Soil Erosion, Hydrodynamics, and Contaminant Fate. As stated on page 52 of TM13, most of these parameters are model-calibration parameters and will be varied within the ranges shown in Table 3-2 to produce the best correlation with observed hydrographs, sediment concentrations, and other water-quality concentrations at selected locations on Woman Creek. All of the parameters in the Precipitation/Runoff and Soil Erosion portions of Table 3-2 are calibration parameters determined by formula from field values. In the Hydrodynamic portion of Table 3-2, median bed-sediment diameter will be determined from several site-specific samples. Channel characteristics of Woman Creek will be determined from site-specific data. In the Contaminant Fate portion of Table 3-2, all variables will be initially estimated from literature values but final values will be from the calibration runs. Because this model has been used world-wide in many different hydrologic settings, numerous experience data are available for all the parameters in Table 3-2.

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	Section 3.4 Surface Water Model (continued)	Please provide EPA a copy of the 1992 ASI report, "Preliminary Draft, Data Summary Report, Final Phase I RFI/RI Work Plan, Water Quality and Bottom Sediment Chemistry Data Assessment, Rocky Flats Plant, Woman Creek Priority Drainage (Operable Unit 5)".	We will provide a 1994 version.
42	Section 3.4.1	It's difficult to understand exactly what the six scenarios are that will be modelled. Rewrite this section to clarify the scenarios.	The six scenarios are based upon one low-flow period (for example, the months of June through January) and one high-flow period (for example, the months of February through May) for each of a typical dry-flow year (for example, 1977-78), an average-flow year, and a wet-flow year (for example, 1982-83). Therefore, the six scenarios are: (1) low-flow period during a dry year; (2) high-flow period during a dry year; (3) low-flow period during an average year; (4) high-flow period during an average year; (5) low-flow period during a wet year; and (6) high-flow period during a wet year. These six scenarios appear to cover the possible flow regimes which may transport contaminants in Woman Creek.

Reviewer's Name: Bonita Lavelle
Organization: U.S. Environmental Protection Agency
Phone No: (303) 294-1081
Date: April 19, 1994